Analytical Data Package Prepared For

CH2M Hill Plateau Remediation

Radiochemical Analysis By

TestAmerica Inc

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code: TARL

Data Package Contains 14 ***Pages***

Report No.: 68366

Results in this report relate only to the sample(s) analyzed.

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
W07430	F16-025	B34TH5	J6C280410-1	M8E8K1AA	9M8E8K10	6089027

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Certificate of Analysis

CH2M Hill Plateau Remediation Company
P.O. Box 1600
Mail Stop – R3-60
Richland, WA 99352

March 31, 2016

Attention: Scot Fitzgerald

SAF Number	:	F16-025
Date SDG Closed	:	March 28, 2016
Number of Samples	:	One (1)
Sample Type	:	Water
SDG Number	:	W07430
Data Deliverable	:	7-Day / Summary

CASE NARRATIVE

I. Introduction

On March 28, 2016, one sample was received at TestAmerica (TARL). Upon receipt, the sample was assigned laboratory ID numbers to correspond with the CH2M specific IDs.

II. Sample Receipt

The sample was received in good condition and no anomalies were noted during check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

Liquid Scintillation Counting
Tritium by method RL-LSC-005

IV. Quality Control

The analytical results for each analysis performed includes a minimum of one laboratory control sample (LCS), one method (reagent) blank, and one duplicate sample analysis. Any exceptions have been noted in the "Comments" section.

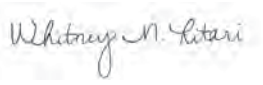
QC and sample results are reported in the same units.

V. Comments

Liquid Scintillation Counting
Tritium by method RL-LSC-005:
The Matrix Spike failed with a 34% recovery. The sample and duplicate results for this batch exceed five times the expected value. No other analytical or quality issues were noted. Except as noted, the sample results and associated batch QC results are within contractual requirements.

We certify that this data package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

Reviewed and approved:



Digitally signed by
Whitney Ritari
Date: 2016.03.31 18:24:56
-07'00'

Whitney Ritari
Project Manager

Drinking Water Method Cross References

	DRINKING WATER ASTM METHOD CROSS REFERENCES	
Referenced Method	**Isotope(s)**	**TestAmerica Richland's SOP No.**
EPA 901.1	Cs-134, I-131	RL-GAM-001
EPA 900.0	Alpha & Beta	RL-GPC-001
EPA 00-02	Gross Alpha (Coprecipitation)	RL-GPC-002
EPA 903.0	Total Alpha Radium (Ra-226)	RL-RA-002
EPA 903.1	Ra-226	RL-RA-001
EPA 904.0	Ra-228	RL-RA-001
EPA 905.0	Sr-89/90	RL-GPC-003
ASTM D5174	Uranium	RL-KPA-003
EPA 906.0	Tritium	RL-LSC-005

Results in this report relate only to the sample(s) analyzed.

Uncertainty Estimation

TestAmerica Richland has adopted the internationally accepted approach to estimating uncertainties described in “NIST Technical Note 1297, 1994 Edition”. The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, R = constants * f(x,y,z,...). The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value (S/?n), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or TestAmerica.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
CSU (#s) ***u_c Combined Standard Uncert.***	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, *u_c the combined standard uncertainty*. The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations.
CRDL (RL)	Contractual Required Detection Limit as defined in the Client's Statement Of Work or TestAmerica "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. Lc=(1.645 * Sqrt(2*(BkgrndCnt/BkgrndCntMin)/SCntMin)) * (ConvFct/(Eff*Yld*Abn*Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC|MDA	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. MDC = (4.65 * Sqrt((BkgrndCnt/BkgrndCntMin)/SCntMin) + 2.71/SCntMin) * (ConvFct/(Eff * Yld * Abn * Vol) * IngrFct). For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the **Work Order** Number.
RER	The equation Replicate Error Ratio = (S-D)/[sqrt($TPUs^2$ + $TPUd^2$)] as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUd is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by TestAmerica upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F16-025-044	PAGE 1 OF 1
COLLECTOR J.R. Aguilar/CHPRC	**COMPANY CONTACT** TODAK, D	**TELEPHONE NO.** 376-6427	**PROJECT COORDINATOR** TODAK, D	**PRICE CODE** C05 **AIR QUALITY** ☐	**DATA TURNAROUND** 7 Days / 7 Days
SAMPLING LOCATION C9416, I-001	**PROJECT DESIGNATION** FY2016 200-UP-1 Remedial Action Wells Sampling and Analysis - Water		**SAF NO.** F16-025		
ICE CHEST NO. N/A	**FIELD LOGBOOK NO.** HNF-N-507-25/93	**ACTUAL SAMPLE DEPTH** 304.5'	**COA** 303979	**METHOD OF SHIPMENT** GOVERNMENT VEHICLE	**ORIGINAL**
SHIPPED TO TestAmerica Incorporated, Richland	**OFFSITE PROPERTY NO.** N/A		**BILL OF LADING/AIR BILL NO.** N/A		

MATRIX*
A=Air
DL=Drum Liquids
DS=Drum Solids
L=Liquid
O=Oil
S=Soil
SE=Sediment
T=Tissue
V=Vegetation
W=Water
WI=Wipe
X=Other

POSSIBLE SAMPLE HAZARDS/ REMARKS
*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1. NA

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None
HOLDING TIME	6 Months
TYPE OF CONTAINER	P
NO. OF CONTAINER(S)	1
VOLUME	1L
SAMPLE ANALYSIS	TRITIUM_DIST_LSC: COMMON (Tritium);

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B34TH5	WATER	MAR 28 2016	1246	-

J6C280410
WD7430
Due 4-4-16
M8E8K

J6C280410

FILTER

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM J.R. Aguilar/CHPRC	DATE/TIME 1320 MAR 28 2016	RECEIVED BY/STORED IN L.D. Wall CHPRC	DATE/TIME 1320 MAR 28 2016	FILTER
RELINQUISHED BY/REMOVED FROM L.D. Wall CHPRC	DATE/TIME MAR 28 2016 1455	RECEIVED BY/STORED IN J. Bock, TARL	DATE/TIME MAR 28 2016 1455	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	

LABORATORY SECTION	**RECEIVED BY**	**TITLE**	**DATE/TIME**
FINAL SAMPLE DISPOSITION	**DISPOSAL METHOD**	**DISPOSED BY**	**DATE/TIME**

PRINTED ON 3/15/2016 **FSR ID** = FSR26274 **TRVL NUM** = TRVL-16-103 A-6003-618 (REV 2)

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March 31, 2016

Sample Check-in List

Date/Time Received: 3-28-16 / 1455 Container GM Screen Result: (Airlock) 0 cpm Initials [ ]
Sample GM Screen Result (Sample Receiving) 0 cpm Initials [ ]

Client: FLH SDG #: 480430 SAF #: F16-025 NA [ ]

Lot Number: JLC280410

Chain of Custody # F16-025-044

Shipping Container ID or Air Bill Number : NA [ ]

Samples received inside shipping container/cooler/box Yes [ ] Continue with 1 through 4. Initial appropriate response.
No [ ] Go to 5, add comment to #16.

1. Custody Seals on shipping container intact? Yes [ ] No [ ] No Custody Seal [ ]
2. Custody Seals dated and signed? Yes [ ] No [ ] No Custody Seal [ ]
3. Cooler temperature: 6.6 °C IR NA [ ]
4. Vermiculite/packing materials is NA [ ] Wet [ ] Dry [ ]

Item 5 through 16 for samples. Initial appropriate response.

5. Chain of Custody record present? Yes [ ] No [ ]
6. Number of samples received (Each sample may contain multiple bottles): 1
7. Containers received: 1 x 4
8. Sample holding times exceeded? NA [ ] Yes [ ] No [ ]
9. Samples have: ____tape ____hazard labels ____custody seals ____appropriate sample labels
10. Matrix: ____A (FLT, Wipe, Solid, Soil) ____I (Water) ____S (Air, Niosh 7400) ____T (Biological, Ni-63)
11. Samples:
____are in good condition ____are leaking ____are broken
____have air bubbles (Only for samples requiring no head space) ____Other
12. Sample pH appropriate for analysis requested Yes [ ] No [ ] NA [ ]
(If acidification is necessary go to pH area & document sample ID, initial pH, amount of HNO_3 added and pH after addition on table)
13. Were any anomalies identified in sample receipt? Yes [ ] No [ ]
14. Description of anomalies (include sample numbers): NA [ ]
15. Sample Location, Sample Collector Listed on COC? * Yes [ ] No [ ]
*For documentation only. No corrective action needed.
16. Additional Information: N/A

[ ] Client/Courier denied temperature check. [ ] Client/Courier unpack cooler.

Sample Check-in List completed by Sample Custodian:
Signature: Julie Bock Date: 3.28.16

Client Notification needed? Yes [ ] No [ ] Date:
By:
Person contacted:

[ ] No action necessary; process as is

Project Manager Whitney McPeters Date 3/28/16

Sample Results Summary

Date: 31-Mar-16

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 68366 **SDG No:** W07430

Batch / Client Id / Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
6089027 TRITIUM_DIST_LSC								
B34TH5								
M8E8K1AA	H-3	2.63E+04 +- 9.2E+02		pCi/L	100%	3.00E+02	4.00E+02	
B34TH5 DUP								
M8E8K1AD	H-3	2.55E+04 +- 9.0E+02		pCi/L	100%	3.02E+02	4.00E+02	3.1

No. of Results: 2

QC Results Summary

Date: 31-Mar-16

TestAmerica Inc TARL

Ordered by Method, Batch No, QC Type,.

Report No. : 68366 **SDG No.:** W07430

Batch Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	LCS Recovery	Bias	MDL
TRITIUM_DIST_LSC								
6089027 MATRIX SPIKE, B34TH5								
M8E8K1AC	H-3	5.08E+02 +- 1.3E+03		pCi/L	100%	34%	-0.7	3.49E+02
6089027 BLANK QC,								
M8FAM1AA	H-3	-5.68E+01 +- 1.4E+02	U	pCi/L	100%			3.09E+02
6089027 LCS,								
M8FAM1AC	H-3	2.69E+03 +- 2.4E+02		pCi/L	100%	100%	0.0	3.06E+02

No. of Results: 3

Bias - (Result/Expected)-1 as defined by ANSI N13.30.

U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

FORM I

SAMPLE RESULTS

Date: 31-Mar-16

Lab Name:	**TestAmerica Inc**	**SDG:**	W07430	**Collection Date:**	3/28/2016 12:46:00 PM
Lot-Sample No.:	**J6C280410-1**	**Report No. :**	68366	**Received Date:**	3/28/2016 2:55:00 PM
Client Sample ID:	**B34TH5**	**COC No. :**	F16-025-044	**Matrix:**	WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6089027	TRITIUM_DIST_LSC			**Work Order:** M8E8K1AA		**Report DB ID:** 9M8E8K10						
H-3	**2.63E+04**		5.4E+02	9.2E+02	3.00E+02	pCi/L	100%	*(87.6)*	3/30/16 10:25 a		0.00503	LSC8
						1.43E+02	4.00E+02	*(57.3)*			L	

No. of Results: 1 **Comments:**

March 31, 2016

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MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

FORM II

Date: 31-Mar-16

DUPLICATE RESULTS

Lab Name:	**TestAmerica Inc**	**SDG:**	W07430	**Collection Date:**	3/28/2016 12:46:00 PM
Lot-Sample No.:	**J6C280410-1**	**Report No. :**	68366	**Received Date:**	3/28/2016 2:55:00 PM
Client Sample ID:	**B34TH5 DUP**	**COC No. :**	F16-025-044	**Matrix:**	WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6089027	TRITIUM_DIST_LSC		**Work Order:** M8E8K1AD			**Report DB ID:** M8E8K1DR			**Orig Sa DB ID:** 9M8E8K10			
H-3	2.55E+04		5.4E+02	9.0E+02	3.02E+02	pCi/L	100%	(84.4)	3/30/16 01:09 p		0.00503	LSC8
	2.63E+04		**RPD**	**3.1**		4.00E+02		(56.9)			L	

No. of Results: 1 **Comments:**

March 31, 2016

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TestAmerica Inc **RPD - Relative Percent Difference.**

rptSTLRchDupV5.5.1 A2002 **MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.**

FORM II

BLANK RESULTS

Date: 31-Mar-16

Lab Name: TestAmerica Inc **SDG:** W07429

Matrix: WATER **Report No. :** 68366

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Lc	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 6089027	TRITIUM_DIST_LSC			**Work Order:** M8FAM1AA		**Report DB ID:** M8FAM1AB						
H-3	-5.68E+01	U	1.2E+02	1.4E+02	3.09E+02	pCi/L	100%	-0.18	3/30/16 02:32 p		0.00502	LSC8
					1.47E+02	4.00E+02		-0.81			L	

No. of Results: 1 **Comments:**

March 31, 2016

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MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

FORM II

Date: 31-Mar-16

LCS RESULTS

Lab Name: TestAmerica Inc **SDG:** W07429

Matrix: WATER **Report No. :** 68366

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 6089027	TRITIUM_DIST_LSC			**Work Order:** M8FAM1AC			**Report DB ID:** M8FAM1CS						
H-3	2.69E+03		2.1E+02	2.4E+02	3.06E+02	pCi/L	100%	2.70E+03	8.11E+01	100%	3/30/16 03:54 p	0.00503	LSC8
							Rec Limits:	70	130	0.0		L	

No. of Results: 1 **Comments:**

March 31, 2016

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TestAmerica Inc **Bias** - (Result/Expected)-1 as defined by ANSI N13.30.

rptSTLRchLcs
V5.5.1 A2002

FORM II

MATRIX SPIKE RESULTS

Date: 31-Mar-16

Lab Name: TestAmerica Inc **SDG:** W07430

Lot-Sample No.: J6C280410-1, B34TH5 **Report No. :** 68366 **Matrix:** WATER

Parameter	SpikeResult, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDC|MDA	Rpt Unit	Yield	Rec-overy	Expected, Uncert	Analysis, Prep Date	Aliquot Size	Analy Method, Primary Detector
Batch: 6089027	**Work Order:** M8E8K1AC			**Report DB ID:** M8E8K1CW			**Orig Sa DB ID:** 9M8E8K10					
H-3	5.08E+02		5.9E+02	1.3E+03	3.49E+02	pCi/L	100%	33.86%	1.50E+03	3/30/16 11:47 a	0.00431	TRITIUM_DIST_LSC
	2.63E+04								4.51E+01		L	LSC8

Number of Results: 1

Comments:

March 31, 2016

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TestAmerica Inc

rptSTLRchMs
V5.5.1 A2002

RER - Replicate Error Ratio = (S-D)/[sqrt(sq(TPUs)+sq(TPUd))] as defined by ICPT BOA.

Bias - (Result/Expected)-1 as defined by ANSI N13.30.